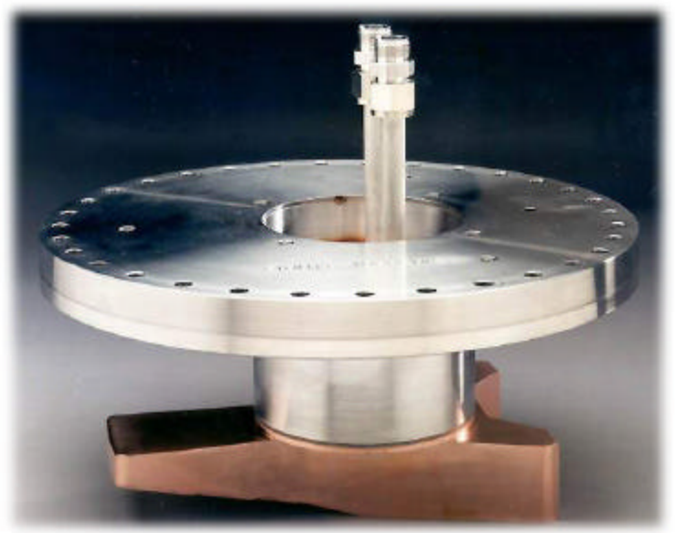
SYSTEM RESPONSIBILITIES

- SR ABSORBERS WATER COOLING CIRCUITS
- PAR,BOOSTER AND SR KICKER MAGNETS
- APS PW TEMPERATURE CONTROL USING PLC'S
- VIBRATION MONITORING OF PUMPS AND MOTORS
- OTHER USEFUL CONTRIBUTIONS

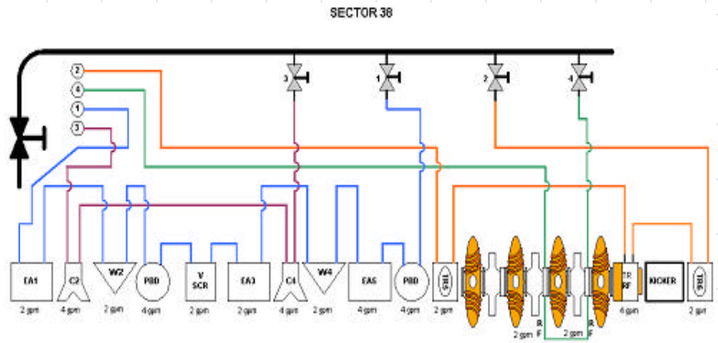
SR ABSORBER WATER CIRCUITS AND FLOW MONITORING

- 240+ Absorbers at strategic locations in vacuum chamber protect uncooled surfaces from x-ray radiation.



Crotch absorber

SR ABSORBER WATER CIRCUITS AND FLOW MONITORING

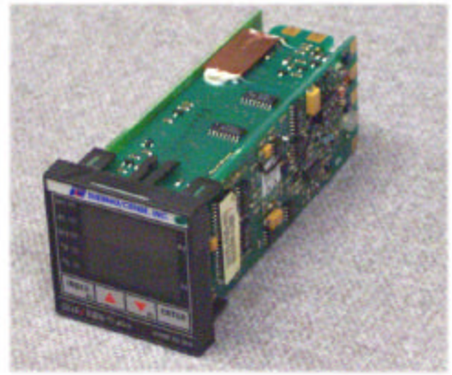


- Absorbers have been grouped together to form 3 or 4 cooling circuits per sector.

- Flow through each circuit is 2 or 4 gpm and measured by YOKAGOWA flowmeters.

Rick Putnam
3/18/2003

SR ABSORBER WATER CIRCUITS AND FLOW MONITORING

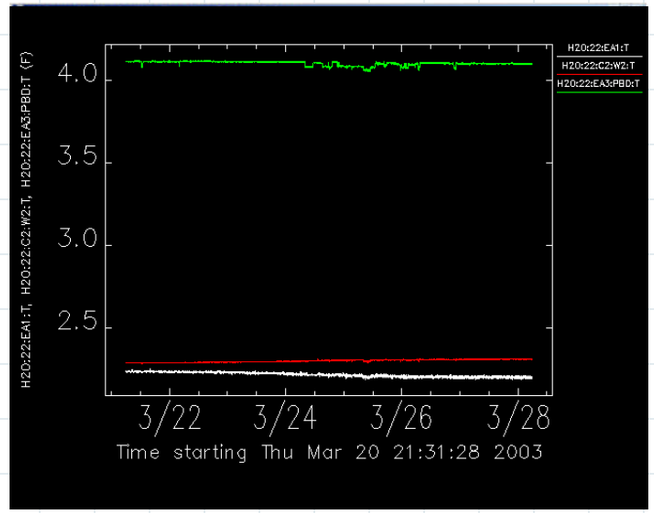


- 124 Love controller readouts in 40 consoles display and interlock flows.

SR ABSORBER WATER CIRCUITS AND FLOW MONITORING

- Preventive monitoring of flow readings by WEB page, EPICS screens and bi-weekly rounds.

- This close monitoring results in the replacement of approx. 6 – 8 units per year due to erratic readings and noncommunication. This is done to prevent beam interruptions due to Love controller failures.



Absorber flow web page

Rick Putnam
3/18/2003

Mechanical Engineering Group
Accelerator Systems Division

Advanced Photon Source
Argonne National Laboratory

SR ABSORBER WATER CIRCUITS AND FLOW MONITORING

UPGRADES FOR RELIABLITIY

- Flow measuring and determining elements moved to top of Storage Ring tunnel.
- This eliminates radiation damage and for allows for maintenance with no tunnel access.
- Replaced Griswold flow regulators with a coiled length of SS tubing trimmed to give the desired flow.

Absorber flow cabinet

Griswold flow regulators

SR ABSORBER WATER CIRCUITS AND FLOW MONITORING

UPGRADES FOR RELIABLITIY

- Replace Love controllers with PLC system.
- This allows more reliability (less electronics) better communications (ethernet) and the ability to add other sensors for more predictive monitoring.

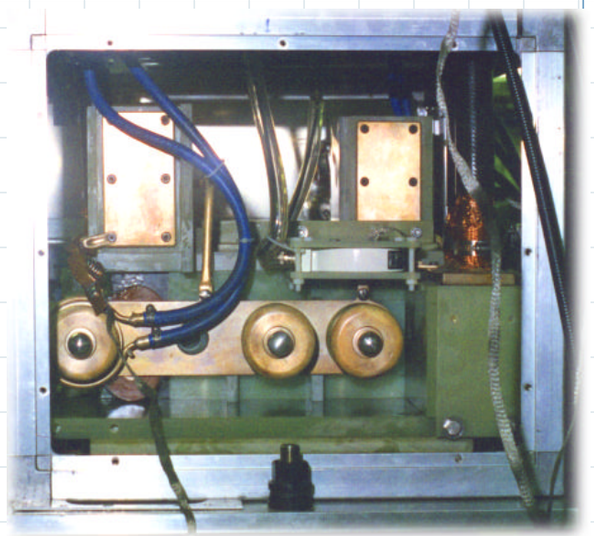
Love Controller console

A-B CONTROLOGIX CHASSIS

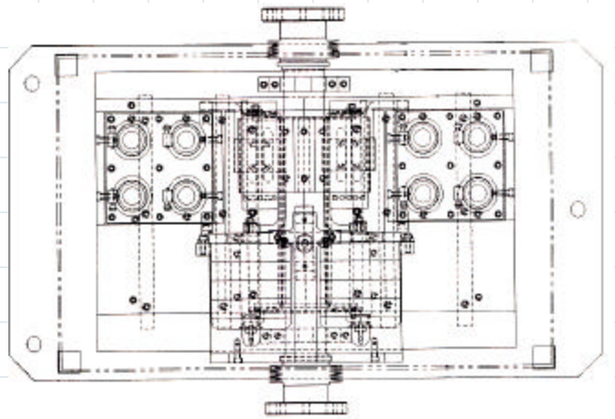
APS KICKER MAGNETS

- PAR Kickers – Injection and Extraction
- Booster Kickers – Injection and Extraction
- SR. Kickers – Injection and Pinger

Preventive maintenance
Spare parts
Ceramic Vacuum chambers



PAR Injection Kicker

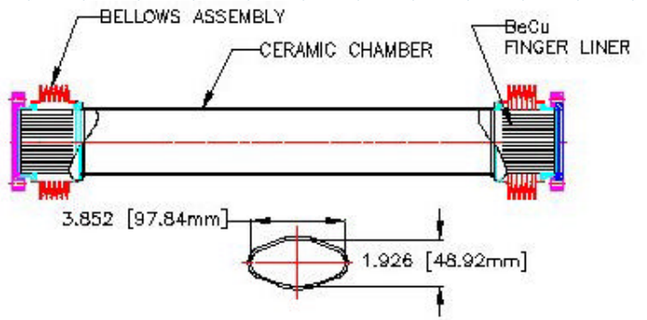


Booster Injection Kicker

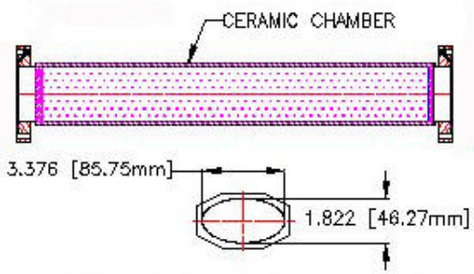
Rick Putnam
3/18/2003

SR KICKER MAGNET CERAMIC VACUUM CHAMBER

- Redesigned chamber for better reliability.
- Mo/Mg internal coating wetted to inside ceramic surface.
- LESS variance of internal resistance from chamber to chamber
- Reduced heating by eliminating bellows and fingers



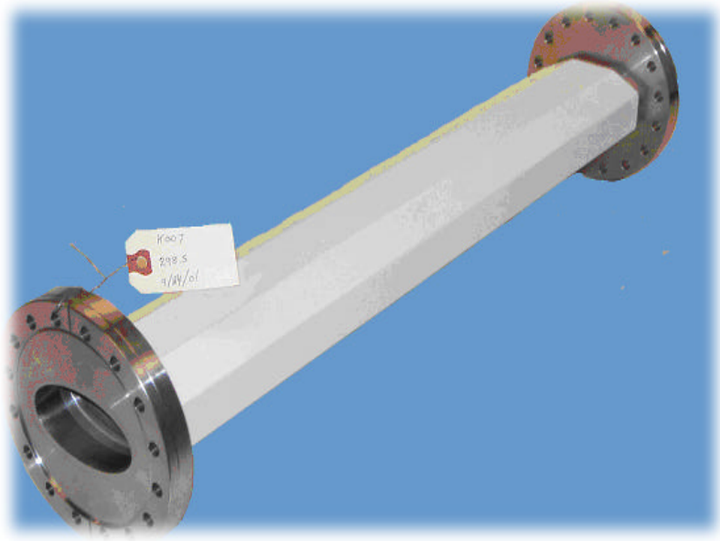
CURRENT KICKER MAGNET CHAMBER



REDESIGNED KICKER MAGNET CHAMBER

SR KICKER MAGNET CERAMIC VACUUM CHAMBER

- 12 chambers in-house
- Measured magnetically
- Vacuum tested
- Ready for installation



NEW CHAMBER

Rick Putnam
3/18/2003

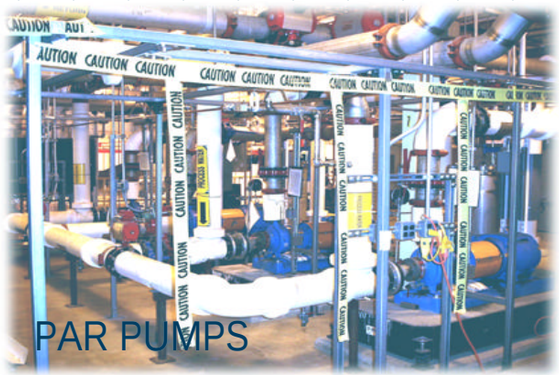
Mechanical Engineering Group
Accelerator Systems Division

Advanced Photon Source
Argonne National Laboratory

TEMPERATURE CONTROL OF SECONDARY WATER SYSTEMS USING A-B PLC'S

- Temperature control using AB PLC's.
- Typical control is +/- .2 degree F.
- Areas Completed
  - Storage ring
  - RF East & West
  - Booster North
  - Linac skids
- Areas in progress.
  - Par
  - Booster South
  - Leutl

RF EAST A-B SYSTEM



PAR PUMPS

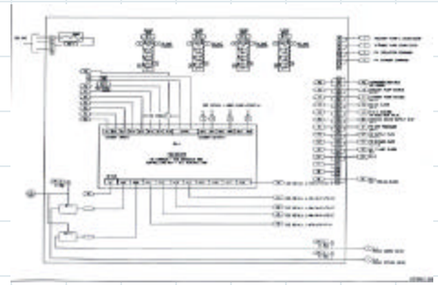
Rick Putnam
3/18/2003

Mechanical Engineering Group
Accelerator Systems Division

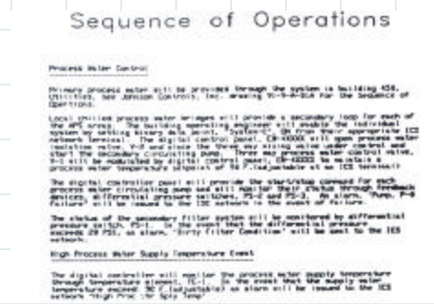
Advanced Photon Source
Argonne National Laboratory

TEMPERATURE CONTROL OF SECONDARY WATER SYSTEMS USING A-B PLC'S

CONVERSION TO FULL A-B CONTROL



- METSYS LCP and DX9100 failures.
- Next logical step is to convert Control of pumps from Johnson Controls to A-B PLC's.
- A-B PLC-5 systems VERY reliable.
- Better communication with EPICS - gives easier access to real time and archived data (screens and web pages).



Sequence of Operations

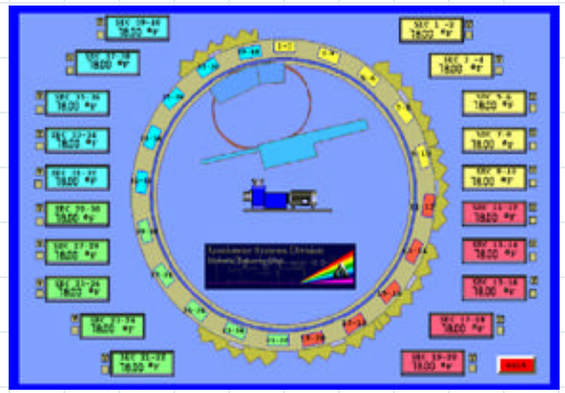
Rick Putnam
3/18/2003

TEMPERATURE CONTROL OF SECONDARY WATER SYSTEMS USING A-B PLC'S

CONVERSION TO FULL A-B CONTROL

- Convert J-C functions and operations.
- A-B systems are widely used at APS.
- Programming both ladder logic and Human Machine Interface (HMI) will be done in-house.
- Maintenance and repair will be faster and easier.
- Reduced spares inventory.

Ladder logic



RSView 32 HMI

Rick Putnam
3/18/2003

TEMPERATURE CONTROL OF SECONDARY WATER SYSTEMS USING A-B PLC'S

- HMI for preventive monitoring and programming of A-B systems.

TECHNICIAN WORKSTATION

- Training of personnel both in-house and at A-B to do programming and maintenance.

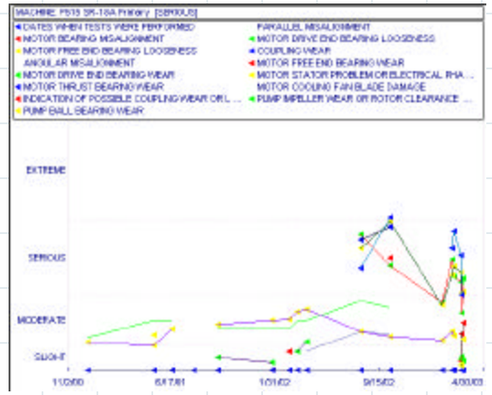
TECHNICIAN TRAINING AREA

Rick Putnam
3/18/2003

VIBRATION MONITORING OF MOTORS AND PUMPS IN PROCESS WATER SYSTEMS

- SR mezzanine, RF galleries, Booster and PAR systems.
- Vibration data collected on motor and pump bearings, couplings, and proper alignment.
- Are adding user SR DI skids and Linac water skids.

COLLECTING DATA



Rick Putnam
3/18/2003

Mechanical Engineering Group
Accelerator Systems Division

Advanced Photon Source
Argonne National Laboratory

VIBRATION MONITORING OF MOTORS AND PUMPS IN PROCESS WATER SYSTEMS

- Collected data is processed and findings displayed.
- Depending on severity level preventive maintenance service is performed if indicated.
- Many failures of pumps and motors have been prevented by use of this predictive maintenance and analysis system.

P515 SR-18A Primary
Report generated on: 3/12/03 02:13 PM
Acquired: 3/12/03 02:13 PM 1xM = 3585 RPM Averages: 9

Maximum level: 113 (+8) VdB at 5xM on 3R in low range

RECOMMENDATIONS:

IMPORTANT: REPLACE MOTOR FREE END BEARING
IMPORTANT: REPLACE MOTOR DRIVE END BEARING
IMPORTANT: REPLACE COUPLING AND ALIGN UNIT.

DIAGNOSES:

SERIOUS COUPLING WEAR
91 (+16) VdB at 3xM on 2A in low range
95 (+16) VdB at 3xM on 2R in low range
100 (+14) VdB at 3xM on 2T in low range
90 (+6) VdB at 3xM on 3R in low range
97 (+9) VdB at 3xM on 3T in low range
109 (+5) VdB at 1xM on 2A in low range
107 (+11) VdB at 1xM on 3A in low range
85 (+27) VdB at 6xM on 2A in low range
91 (+26) VdB at 6xM on 2R in low range
90 (+24) VdB at 6xM on 2T in low range

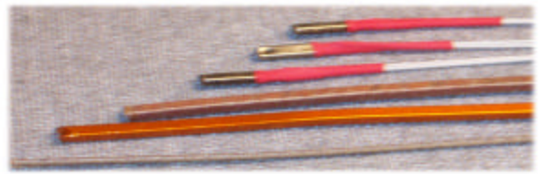
SERIOUS MOTOR FREE END BEARING LOOSENESS
91 (+15) VdB at 4xM on 1R in low range
92 (+27) VdB at 6xM on 1R in low range
81 (+9) VdB at 14xM on 1R in high range
101 (+18) VdB at 4xM on 1T in low range
86 (+23) VdB at 6xM on 1T in low range
94 (+16) VdB at 3xM on 1A in low range
101 (+18) VdB at 3xM on 1R in low range
105 (+22) VdB at 3xM on 1T in low range
85 (+9) VdB at 1.33xM on 1A in low range
109 (+6) VdB at 1xM on 1A in low range
99 (+8) VdB at 1xM on 1R in low range
104 (+4) VdB at 1xM on 1T in low range

SERIOUS MOTOR DRIVE END BEARING LOOSENESS
85 (+27) VdB at 6xM on 2A in low range
87 (+14) VdB at 4xM on 2R in low range
91 (+26) VdB at 6xM on 2R in low range
80 (+7) VdB at 14xM on 2R in high range
97 (+16) VdB at 4xM on 2T in low range
90 (+24) VdB at 6xM on 2T in low range
91 (+16) VdB at 3xM on 2A in low range
95 (+16) VdB at 3xM on 2R in low range
100 (+14) VdB at 3xM on 2T in low range
109 (+5) VdB at 1xM on 2A in low range
104 (+4) VdB at 1xM on 2R in low range
106 (+5) VdB at 1xM on 2T in low range

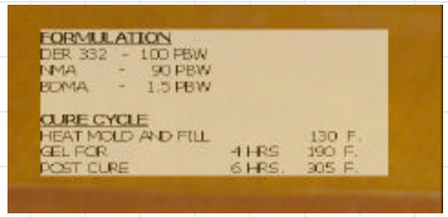
Rick Putnam
3/18/2003

SOME OTHER CONTRIBUTIONS, SUPPORT AND RESPONSIBILITIES

- MAGNETS AND COILS
  - Winding,insulation,
  - Vacuum impregnation
  - Thermal protection.



- EPOXIES AND FORMULATIONS



- INSTRUMENTATION
  - Sensors and transmitters
  - Data collection
  - Temperature control and measurement
  - Flow measurement
- TRAINING
  - Allen-Bradley systems
  - Absorber systems

THE END

THANK YOU

Rick Putnam
3/18/2003

Mechanical Engineering Group
Accelerator Systems Division

Advanced Photon Source
Argonne National Laboratory